30 - EVALUATION OF THE CLINICAL EFFECTS OF BOTULINUM TOXIN ASSOCIATED WITH PHYSIOTHERAPY FOR CHILDREN WITH CEREBRAL PALSY OF SPASTIC DIPLEGIA

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INTRODUCTION

The Cerebral Palsy (CP) characterizes a group of permanent cerebral disorders of the central nervous system without progressive characteristics. The children who present CP have as main characteristics motor implications that influence on their functional performance, affecting the movements and posture, causing physical inability for their whole lives. (CAMARGOS et al, 2007). Although the lesion is stable or non progressive, the musculoskeletal manifestations change as the child grows up. The motor abilities of several children with CP improve as they grow up, however, it is considerably slower if compared with children who are not affected (LEITE, J. M.; PRADO, F.G, 2004).

The CP consists of a heterogeneous group of disorders and its classification is based on the alteration of muscle tonus (spacity, dyskinesia, ataxia and associations). The spastic form is the most found disorder and is the most frequent in 88% of cases. The spasticity is a clinical condition that may be defined as the increase of resistance to passive stretching of a muscle or a muscle group; it depends on the speed of the movement, complicating the process of neuromotor recovery in individuals with neurological diseases (SGROT, 2004).

According to the topography the spastic disorder may be classified as quadriplegia, diplegia and hemiplegia (LEITE, J. M. & PRADO, F.G, 2004). The diplegia occurs in 10 to 30 % of patients, being the most common form found in premature babies. It is an implication of lower limbs, commonly evidencing a deep hypertonia of the adductors. There are different graduations regarding the intensity of the disorder, and it may be little affected (having recovery and good prognostic, getting adapted to daily life); while others have bad evolution with severe functional limitations (LEITE; PRADO, 2004).

The botulinum toxin type A (BTA) is a protein that is produced by the anaerobic bacterium called Clostridium botulinum which consists of the blocking of acetylcholine release in the nervous endings without destroying them (SGROTT, 2004). After the application of BTA, the muscle group that was chosen suffers a reduction of spasticity, easing the movements to accomplish the physiotherapeutic treatment, in which the physiotherapist must develop a treatment protocol that aims to accelerate and optimize the results (BAIOCATO, 2000).

Nowadays the use of Botulinum Toxin type A has grown for the treatment of spasticity in patients with Cerebral Palsy (CP), clinical evidences register its benefits, due to the fact that it is method that is not so invasive, and with minimal side effects, thus delaying the need of orthopedical surgeries.

It is believed that the association of the BTA's effect with the physiotherapeutic treatment may provide the improvement of the amplitude of movement, the reduction of muscle tone, favoring the adequate positioning, consequently improving the functionability in children with CP. However, there are few studies about this type of treatment. Due to the identification of this blank in previous investigations, this study evaluated the effect of the application of BTA associated with the physiotherapeutic treatment in the modulation of muscle tone and gain of amplitude of movement.

MATERIALS AND METHODS

This research has an exploratory characteristic, in other words, it's a case study of longitudinal cut, with quantitative approach. An eight-year-old boy carrier of diplegic spastic cerebral palsy participated in this study. His parents signed the free term clarification after being aware of the objectives and procedures of the research. The study was accomplished at the Rehabilitation Center – FAG, which belongs to Assis Gurgacz College, by the approval of the Ethical Committee of the Assis Gurgacz College – FAG. The data were collected from May to July/2011. For collecting the data, an evaluation of the muscle tone was carried out using as reference the Durigon & Piemont (1993) Spasticitity Scale (Table 1). This scale classifies the Tone according to the restriction to the passive movement of the tested muscle and the restriction region, being associated to a score ranging from 1 to 8 to classifications for the elaboration of graphs (the higher the score, the more serious the spasticity). For the evaluation of the tone, the patient was positioned comfortably in supine and prone position on a stage with a mat. The evaluator positioned the segment to be evaluated, stabilizing the proximal and carried out passive movements in high and low speed. The muscle groups evaluated were: plantiflexors, dorsiflexors, flexors and extensors of knees, flexors, extensors, internal and external rotators, adductors and abductors of the hips, bilaterally. In the sequence, it was evaluated the amplitude of movement (AOM) of the lower dorsiflexors, popliteal and adductor, using ISP goniometer. For the evaluation of the adductor angle of the hips the patient was positioned in supine position, the center of the goniometer was positioned at the umbilical scar and the moving parts of the goniometer followed the passive movement of the abduction of the hips. For the evaluation of the popliteal angle the patient was kept in the same position, however the goniometer was positioned on the lateral region of the knee articulation, one of the moving parts of the goniometer remained still along the femur and the other part followed the passive movement of the knee extension from 90º of hip flexion. For the evaluation of the dorsiflexors, the patient was kept in supine position, the center of the goniometer was positioned on the lateral malleolus, one of the moving parts remained still along the fibula and the other part followed the passive movement of dorsiflexion of the ankle.

TONE		
1	Hypotonia	There is no resistance during movement
2	Normal tone	No alteration shown
3	Mild Hypertonia	Resistance 1/3 fast movement
4	Mild Hypertonia +	Resistance 1/3 fast and slow movement
5	Moderate Hypertonia	Resistance in 1/2 fast movement
6	Moderate Hypertonia +	Resistance in 1/2 fast and slow movement
7	Severe Hypertonia	Resistance in every fast movement
8	Severe Hypertonia +	Resistance in every fast and slow movement

Table 1 – Classification and score of the tone based on the Durigon & Piemonte scale (1993).

The patient had gone through some evaluations of muscle tone and amplitude of movement bilaterally before the TBA application, after fifteen days and after thirty days, when during this period the child underwent physiotherapy on the ground, aided by the students of the course of physiotherapy of the 7° period (semester), in the Pediatric Physiotherapy Office in the Rehabilitation Center – FAG, four times a week, during forty minutes, for thirty days. A protocol of kinesiotherapy exercises was created based on the "Bobath Neurodevelopment Therapy", whose purposes were: trunk mobility, pelvis and scapula; gain or maintenance of movement amplitude of lower limbs; strengthening, mainly the lower limbs and modulation of muscle tone. For physiotherapy sessions some devices were used such as a platform with mat, roll, and a Swiss ball that were available in the Pediatric Physiotherapy Room.

Together with the sessions of physiotherapy, parents received some recommendations to place their children on the parapodium (stabilizer of orthostatic posture), these children had been undergoing it twice a day for around one hour.

The BTA was applied in the gastrocnemius, ischiotibial and adductor muscles bilaterally. After 48h the child began the physiotherapeutic treatment and parents began following the recommendations. The data were analyzed through Student's T test.

RESUSTS AND DISCUSSION

Table 2 shows the analysis of goniometry of lower limbs, having the adductor angle, popliteal and right and left dorsiflexion, accomplished after fifteen days and after thirty days from the application of BTA. The goniometric values showed significant improvement. The adductor angle had an improvement of 7° from the first to the second evaluation and 36° from the evaluation accomplished before the application of BTA till the last evaluation. The right popliteo angle had an increase of amplitude of movement of 20° from the first evaluation till the second evaluation, while for the third evaluation this increase was of 28° compared to the first evaluation. The same improvement was observed on the left side, with an increase of 15° from the first evaluation compared to the second one and an increase of 26° from the first compared to the third one. Regarding the right dorsiflexion angle, it was observed that the amplitude of movement was kept for the three evaluations while the ankle presented an increase of 11° from the first evaluation till the second one and in the third evaluation the amplitude of movement reduced 1° compared to the second evaluation after the application of BTA an physiotherapy.

		1ª Evaluation (before the application)	2ª Evaluation (15 days later)		3ª Evaluation (30 days later)	
Adductor		52º	59º		88º	
	Right	Left	Right	Left	Right	Left
Popliteo	90º	95º	110º	110º	118º	121º
Dorsiflexion	29º	30º	29º	41º	29º	40º

Table 2 – analysis of "goniometry" of lower limbs.

Graphics 1 and 2 show the scores regarding the muscle tone of bilateral lower limbs during three evaluations.

In graphic number 1, it is possible to observe that the tone of dorsiflexor muscles remained with a moderate hypertonia (plus), and initially, for the plantar flexor muscles it is observed a moderate hypertonia (plus), in the second evaluation it changed to moderate hypertonia and in the third evaluation the tone once again changed to moderate hypertonia (plus). Regarding the flexor muscles of the knees, initially, it presented moderate hypertonia plus and it changed to severe hypertonia not only in the second evaluation but also in the third evaluation. The extensors of the knees and tone remained the same, mild hypertonia.

GRAPHIC 1 – Muscle tone of bilateral lower limbs



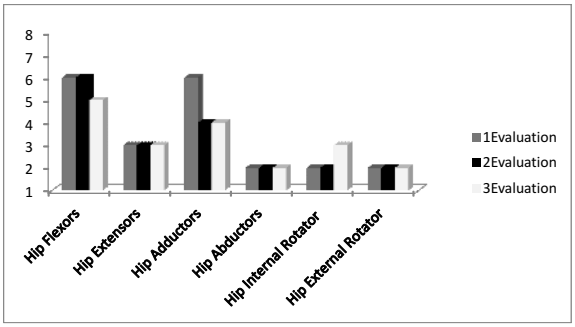
Graphic number 2 shows the analysis of tone of the following muscle groups: hip flexors, hip extensors, hip adductors, hip abductors, internal rotators of the hips and external rotators of the hips.

It is observed that in the flexors of hips in the two first evaluations the tone remained the same severe hypertonia, however, in the third evaluation it changed to moderate hypertonia (plus), evidencing a reduction of tone. The extensors of the hips remained with mild hypertonia (plus).

In the adductors of the hips the tone changed from severe hypertonia to moderate hypertonia, presenting a significant reduction.

As for the adductors of the hips, the tone remained with mild hypertonia in the three evaluations. In the internal rotators of the hips, it is possible to notice that in the first and second evaluation it presented mild hypertonia, in the third evaluation the tone changed to mild hypertonia. In the analysis taken from the external rotators of the hips the tone remained with mild hypertonia.

GRAPHIC 2 – Muscle tone of bilateral lower limbs



BTA is widely used in spastic patients. The muscles that are chosen are usually the gastrocnemius, adductors of the hips and ischiotibial muscles in patients who are diagnosed with Cerebral Palsy.

The physiotherapy associated with BTA is widespread by a lot of professionals who are experts in the rehabilitation of these children presenting satisfactory results (CALDERÓN-GONZÁLES,2002)

The application of BTA alone, however, isn't able to bring satisfactory results. In a study accomplished by Dood,Taylor and Daminiano (2002), it was concluded that kinesiotherapeutic programs promote improvement in the amplitude of movement and tone.

Silva Júnior el al (2003) concluded in their study that the application of BTA in gastrocnemius of spastic diplegic patients associated with physiotherapy decreases the deformity in equine sprained ankle showing improvement in the march.

CAMARGOS et al 2007 presented a case report to describe and evaluate the role of physiotherapy associated with the application of BTA in plantar flexors of a diplegic child. This child was evaluated before application, 30 and 60 days after its application. After 60 days it was observed an improvement of 15% in the amplitude of movement of ankle.

Another study was accomplished by SGROTT(2004), this study applied BTA in the adductor region of hips and physiotherapy during six months in three children with spastic quadriplegic cerebral palsy. The results showed that the abduction amplitude of movement had an increase up to 60%.

As for the other muscle groups such as plantar flexors, it was possible to observe a reduction of tone only in the second evaluation, while the knee flexors did not present a reduction of tone but an increase when compared to the first evaluation.

RESENDE et al(2005) reports in their study the maximum effect of BTA in about 15 days after the application, however, other authors assume that the BTA reaches the maximum effect in 15 days of this study, justifying the data that were obtained.

Twenty four articles were selected, after the analysis of the established criteria, only five articles remained in the study, all were random clinical essays, being synthesized as for characterization and critical evaluation. The scores varied between six and nine regarding the methodological quality, evaluated by PEDro scale. Conclusion: the classification by levels of evidence indicates that there are consistent positive effects regarding the quality of march of this population.

Authors' research such as (SILVA, et al, 2003, PONTES, 2003, CALDERÓN-GONZÁLEZ, R.; CALDERÓN-SEPÚLVEDA, 2002) demonstrate improvement in the degree of amplitude of movement after the injection of BTA in spastic muscles.

CONCLUSION

The use of TBA has brought a new course for the neurological rehabilitation, reducing the risk of fixed deformities improving the positioning of the orthoses and bringing significant improvements to the quality of life of the patients carrying cerebral palsy. In this study the application of TBA associated with physiotherapy influenced mainly in the decrease of spasticity of adductor muscles of the hips and in the increase of the adductor angle. The therapy is believed to have favored the stretch of the muscles and the articular positioning providing more adequate and functional length of the muscle groups.

Although the use of botulinum toxin is being used in clinical practice and studies have been made, there haven't been enough studies to state the reduction of spasticity and functional improvement of children with cerebral palsy. It is necessary to continue the research and to exchange information related to doses, techniques, indication and counter indication for the accomplishment and confirmation of the efficacy of the botulinum toxin in the treatment of spasticity.

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EVALUATION OF THE CLINICAL EFFECTS OF BOTULINUM TOXIN ASSOCIATED WITH PHYSIOTHERAPY FOR CHILDREN WITH CEREBRAL PALSY OF SPASTIC DIPLEGIA

ABSTRACT

Introduction: Cerebral Palsy is also called Chronic Encephalopathy of Infancy and is characterized by motor disorders of non progressive characteristics. The motor disorder is closely related to the area of the Central Nervous System that was injured. Spasticity is a clinical manifestation that frequently interferes with the rehabilitation of children with Cerebral Palsy. Commonly, in order to obtain a better physiotherapeutic action, the clinical staffs have adopted the use of botulinum toxin type A associated with the physiotherapeutic approach. The treatment is based on the control of spasticity making use of medicaments and kinesiotherapy. Among the medicaments that are used as medical blocks, the use of bolulinum toxin has stood out, which aims to cause the reduction of muscle tone and improve the motor control. It is believed that the association of the effect of BTA with the physiotherapeutic treatment may provide the increase of the amplitude of movement, decrease of muscle tone, favoring the adequate positioning, thus, improving the functionality of children with cerebral palsy. Aim: It is believed that the association of the effect of BTA with the therapeutic treatment may provide the increase of amplitude of movement, the decrease of muscle tone, favoring the adequate positioning, thus, improving the functionality of children with CP. However, there are few studies about this type of treatment. Due to the identification of the blank in previous investigations, this study evaluated the effect of the application of BTA associated with the physiotherapeutic treatment in the modulation of muscle tone and gain of amplitude of movement. Methodology: A case study of longitudinal cut, with quantitative approach. An eight-year-old child carrier of diplegic spastic cerebral palsy participated in this study. The evaluation of muscle tone of MMII was accomplished through the spasticity scale of Durigon and Piemont and the amplitude of movement. The evaluation was a pre application type, after 15 days and 30 days of application of BTA being associated with physiotherapy with kinesiotherapeutic exercises. Results and Discussion: Reports in the study of the maximum effect of BTA around 15 days after the application, although other authors consider that the BTA reaches its maximum effect in 1 to 4 weeks, which indicates that the toxin may have reached its maximum effect in 15 days in this study, justifying the data that were obtained. Based on the data obtained in this study, the muscle group that showed the highest gain was the one from adductors of hips together with the decrease of tone of the muscle group, It was possible to notice a significant increase concerning the angle of this adductor. Conclusion: The application of BTA itself, however, is not able to bring satisfactory results. Physiotherapy associated with the application of BTA had influence on the increase of amplitude of movement and decrease of spasticity. It is believed that the therapy favored the stretching of muscles and the joint positioning, providing more adequate and functional length of the muscle groups.

KEY WORDS: Cerebral Palsy, Botulinum Toxin Type A, Physiotherapy.

EVALUATION CLINIQUE DES EFFETS DE LA TOXINE BOTULIQUE ASSOCIÉS À LA THÉRAPIE PHYSIQUE CHEZ LES ENFANTS ATTEINTS DE PARALYSIE CÉRÉBRALE DE DIPLÉGIE SPASTIQUE TYPE

RÉSUMÉ

Introduction: LaParalysie Cérébrale (PC) est définie comme l'EncéphalopathieChronique de l'Enfanceet se caractérise pardes troubles moteursde caractèrenon-progressif. La désorganisation motriceest étroitement liée àla zonedu SystèmeNerveux Central (SNC) blessé.La spasticité estune manifestation cliniquequi interfèresouvent dansla rééducation des enfantsatteints de Paralysie Cérébrale. Communément, afin d'acquérir une meilleureprocédurephysiothérapeutique,les équipes cliniquesont adoptél'utilisation de latoxine botulique de typeA (TBA) associée à l'approchedu traitementphysiothérapeutique. Le traitement est basé surle contrôlede la spasticitéavec des médicaments etde kinésithérapie. Parmi les médicamentsutilisés pour le bloc chimique,a étémis en évidencel'utilisation de latoxine botulique de typeA,qui viseà provoquerla réductiondu tonus musculaireet améliorerle contrôle moteur.On croitque l'association del'effet de laTBAà la physiothérapiepeut fournirl'augmentation del'amplitude des mouvements, de la diminution du tonus musculaire, favorisantle bon positionnement, améliorant ainsi les fonctionnalitésdes enfants atteints deparalysie cérébrale. Objectif:On croitque l'association del'effet de laTBAà la physiothérapiepeut fournirl'augmentation de l'amplitude des mouvements, de la diminution du tonus musculaire, favorisantle bon positionnement, améliorant ainsi les fonctionnalitésdes enfantsavec Paralysie Cérébrale. Cependant, il y a peu d'étudesd'un tel traitement. Selonl'identificationde cet écartdans les enquêtesprécédentes, cetteétude a évalué l'effet de l'application de laTBAassociée àla physiothérapiedans la modulationdu tonus musculaire etgainde l'aplitude de mouvement. Méthodologie:L'étude de cas surl'approchelongitudinale,avec une abordage quantitative. Une enfant de huit ans,souffrant de paralysie cérébralediplégique spastique, a participé de cette étude.On a réalisél'évaluation dutonus musculaire des MMII par l'échelle de la spasticité de Durigon et Piémont et del' amplitude de mouvement.L'évaluation a étépré application après 15jours et 30 joursd'application de laTBAétant associée àdes exercices Kinésiothérapeutiques.Résultats et discussion:Nous rapportonsdans cette étude l'effetmaximalde la TBA dansenviron 15jours après l'application, mais d'autres auteursconsidèrentque laTBAatteint son effet maximaldans 1à 4 semaines, ce qui indique quela toxinepeutêtre atteintson effet maximal dans15 joursjustifiantles données contenues dansla présenteétude.Basé sur des donnéesobtenues dans cette étude, le groupe de musclesqui a démontréla plus forte haussea été desadducteurs de la hanche,concomitante à cettediminution du tonus musculairede ce groupe, nous avons observé une augmentation significativepar rapport àl'angledes adducteurs. Conclusion: L'application de la TBA seule, cependant, n'est pas capable d'apporter des résultats satisfaisants. La kinésithérapie combiné avec l'application de la TBA a influencé l'augmentation de l'amplitude de mouvement et dans la diminution de laspasticité.On croit quela thérapie a favorisé l'étirement musculaire et le positionnement articulaire prévoyant une longueur plus appropriée et fonctionnelle des groupes musculaires.

MOTS CLÉ : Paralysie Cérébrale, Physiothérapie, Toxine Botulique de Type A

EVALUACIÓN CLÍNICA DE LOS EFECTOS ASOCIADOS DE LA TOXINA BOTULÍNICA CON LA TERAPIA FÍSICA EN NIÑOS CON PARÁLISIS CEREBRAL DE DIPLEJÍA ESPÁSTICA TIPO

RESUMEN

Introducción: La Parálisis Cerebral (PC) es conceptuada como Encefalopatia Crónica de la Infancia y se caracteriza por disturbios motores de carácter no progresivo. El transtorno motor está intimamente relacionado con el área del Sistema Nervioso Central (SNC) lesionado. La espasticidad es una manifestación clínica que frecuentemente interfiere en la rehabilitación del niño con PC. A menudo con el propósito de adquirir una mejor actuación fisioterapéutica, los equipos clínicos

han adoptado la utilización de la toxina botulínica tipo A (TBA) asociada al enfoque de la fisioterapia. El tratamiento se basa en el control de la espasticidad a través de medicamentos y kinesioterapia. Entre los medicamentos utilizados para el bloqueo químico, ha sido destacada la utilización de toxina botulínica tipo A, que provoca la reducción del tono muscular y mejora el control motor. Objetivo: Se cree que la asociación del efecto de la TBA al tratamiento fisioterapéutico puede proporcionar aumento de la amplitud de movimiento de la disminución del tono muscular, favoreciendo el posicionamiento adecuado, mejorando así la funcionalidad de niños con parálisis cerebral. Sin embargo, hay pocos estudios sobre ese tipo de tratamiento. En función de la identificación de este hueco en investigaciones previas, este estudio evaluó el efecto de la aplicación de la TBA asociada al tratamiento fisioterapéutico en la modulación del tono muscular y aumento de amplitud de movimiento. Metodologia: Estudio de caso de corte longitudinal, con un enfoque cuantitativo. Participó de este estudio un niño de ocho años portador de Parálisis Cerebral diplégica espástica. Se realizó evaluación del tono muscular de los MMII a través de la escala de espasticidad de Durigon y Piemont y de la amplitud de movimiento. La evaluación fue pre aplicación, después de 15 días y 30 días de aplicación de la TBA siendo asociada a la fisioterapia con ejercicios kinesioterapéuticos. Resultados y discusión: Relata en su estudio el efecto máximo de la TBA en más o menos 15 días después de la aplicación, pero otros autores consideran que la TBA alcanza su efecto máximo en 1 a 4 semanas, lo que indica que la toxina pueda haber logrado su efecto máximo en 15 días en este estudio justificando los datos obtenidos. Con base en las informaciones conseguidas en este estudio, el grupo muscular que demostró mayor aumento fue los de aductores de caderas concominante a esta disminución del tono de este grupo muscular, fue posible observar un aumento significativo en relación al ángulo aductor. Conclusión: únicamente con la aplicación de la TBA , no es capaz de traer resultados satisfactorios. La fisioterapia asociada a la aplicación de TBA influenció en el aumento de la amplitud de movimiento y en la disminución de la espasticidad. Se cree que la terapia favoreció la elongación de la musculatura y el posicionamiento articular proporcionando la longitud más adecuada y funcional de los grupos musculares.

PALABRAS-CLAVE: Parálisis Cerebral, Toxina Botulínica Tipo A, Fisioterapia.

AVALIAÇÃO DOS EFEITOS CLÍNICOS DA TOXINA BOTULÍNICA ASSOCIADA À FISIOTERAPIA EM CRIANÇA COM PARALISIA CEREBRAL DO TIPO DIPLEGIA ESPÁSTICA

RESUMO

Introdução: A Paralisia Cerebral (PC) é conceituada como Encefalopatia Crônica da Infância e se caracteriza por distúrbios motores de caráter não progressivo. A desordem motora está intimamente relacionada com a área do Sistema Nervoso Central (SNC) lesado. A espasticidade é uma manifestação clínica que freqüentemente interfere na reabilitação da criança com PC. Comumente, com o objetivo de adquirir uma melhor atuação fisioterapêutica, as equipes clínicas têm adotado a utilização da toxina botulínica tipo A (TBA) associada à abordagem fisioterapêutica.O tratamento baseia-se no controle da espasticidade através de medicamentos e cinesioterapia. Entre os medicamentos utilizados para o bloqueio químico, tem sido destacada a utilização de toxina botulínica tipo A, que tem como objetivo, provocar a redução do tônus muscular e melhorar o controle motor. Acredita-se que a associação do efeito da TBA ao tratamento fisioterapêutico pode proporcionar aumento da amplitude de movimento, da diminuição do tônus muscular, favorecendo o posicionamento adequado, melhorando assim a funcionalidade de crianças com paralisia cerebral. Objetivo: Realizar uma revisão bibliográfica sobre os efeitos clínicos da aplicação da toxina botulínica tipo A associada à fisioterapia em crianças com PC espástica. Metodologia: Trata-se de um artigo de revisão bibliográfica entre livros e artigos científicos com as palavras-chaves paralisia cerebral, toxina botulínica tipo A e fisioterapia. Resultados: Com esta revisão podemos observar que a TBA é eficiente na redução do tônus muscular, mas não basta, a aplicação da TBA, se a reabilitação não for eficiente, sendo assim ressaltamos a importância da atenção, percepção, preservação do estado de consciência, repetição e interesse do paciente, para executar os movimentos e memorizá-lo. Conclusão: De modo geral, a partir dos estudos encontrados percebe-se que a toxina botulínica tipo A (TBA A) destaca-se com como a mais recente esperança para a reabilitação física do paciente espástico, auxiliando desde um melhor posicionamento, melhora da performance motora,até prevenção de cirurgias para correção de deformidades ortopédicas.

PALAVRAS-CHAVE: Paralisia Cerebral, Toxina Botulínica Tipo A, Fisioterapia.